24-0120013A
May 28, 2021

Christopher McGoldrick
Town Planner
Town of Grafton, MA
30 Providence Road
Grafton, MA 01519

Re: **Village at Grafton Woods**
Response to Traffic Impact Study Peer Review Comments

Dear Chris:

Tighe & Bond is in receipt of Peer Review Comments from MDM Transportation Consultants, Inc. (MDM), dated May 18, 2021. The peer review comments apply to the Traffic Impact and Access Study (TIAS), dated April 2021 for the Village at Grafton Woods Development located at 8 Pine Street in Grafton, Massachusetts at the former Grafton State Hospital. The following presents our response to the peer review.

Peer Review Response

Tighe & Bond has conducted the Traffic Impact Assessment in accordance with industry standard practices and The Town of Grafton Zoning By-Law, Section 8, Subsection 8.2: "Traffic Study Required" and Subsection 8.3 "Adequate Traffic Capacity", October 2019.

The Traffic Impact Analysis, as presented in the Traffic Impact Study, dated April 2021, finds that the additional traffic expected to be generated by the development will not significantly impact traffic operations within the study area.

Response to Comments

The following are responses to comments provided by MDM. As noted in the MDM letter, Tighe & Bond is responding specifically to the sections noted in ***Bold Italics*** in the MDM letter:

Existing Conditions:

2. Traffic Volumes:

Comment: *MDM concurs that baseline traffic conditions present in the TIS are reasonable representative of average pre-pandemic traffic patterns and volumes. However, Applicant should confirm volumes to/from Centennial Drive reflect typical/ full building occupancy of properties along that roadway. Field review suggests that the IDEXX building is potentially operating at below capacity and the property at 15 Centennial Drive (FAFL) is currently vacant. Sensitivity analysis of the primary Site driveway opposite Centennial Drive may be appropriate to the extent additional volume is anticipated for these properties.*

Response: As noted in Table 2 of the TIAS, the weekday morning traffic volumes at the Pine Street/Centech Boulevard at Centennial Drive intersection were developed using turning movement counts collected in December 2020 and calibrated up to be consistent with previous ATR data on Pine Street collected by MassDOT in June 2019. The calibration resulted in a 75% increase in traffic volumes on

all the intersection approaches from the counted values. The weekday afternoon and Saturday midday volumes were developed utilizing the 2019 traffic volumes from the approved "Traffic Impact Analysis for the MJ's Market" (13 Centennial Drive), dated October 2019, and grown to 2020 with the 0.5% annual growth rate. In addition, the traffic analyses show that the intersection operates at LOS C or better under future conditions with queue of 1-2 vehicle lengths. Based on the use of calibrated existing available data, previously approved traffic volumes, and conservative growth assumptions, we believe that the traffic volumes are sufficient to represent future conditions, and the analyses indicate acceptable operations under these future conditions.

4. Vehicle Speeds:

Comment: *MDM recommends that a speed study (minimum 48-hour period) be conducted for Pine Street just north of the MBTA driveway (i.e., the northbound approach to the southerly driveway and proposed crosswalk). These data would ensure that proper design speeds are selected for the northbound approach to this driveway and crosswalk location, which may vary from the data collected further north near Green Street. As discussed in more detail under Sight Distances below, visibility for the southerly driveway and the proposed crosswalk in that vicinity is of particular concern given roadway curvature and roadside features that impede sight line.*

Response: As outlined in Section 4.1 of the TIAS, speed data on Pine Street/Centech Boulevard was collected in December 2020 between Green Street and Centennial Drive. This location is representative of operating speeds of the roadway and collecting additional data to the south is likely to yield similar speeds. Intersection sight distances are addressed in the response to Comment 5.

5. Sight Distances:

Comment: *MDM recommends that the applicant provide sight line calculation sheets for both stopping site distance (SSD) and intersection sight distance (ISD). Measured site distances for both SSD and ISD for each driveway location should be provided and shown on site plans in plan and profile. Measured distances (Intersection Sight Distance and Stopping Sight Distance) should meet or exceed the minimum values required for measured 85th percentile travel speeds following AASHTO guidance based on supplemental speed study cited under Comment 4. While the TIS indicates that ISD criteria will be met at both driveway locations, achievable sight lines at the southerly driveway in particular are potentially impacted by roadway curvature and existing/ proposed roadside vegetation looking South as well as guardrail adjacent to the MBTA track overpass. These features substantially restrict visibility of the driveway.*

Response: The northern site driveway was located opposite Centennial Drive, in a conventional four-way intersection, to reduce conflict points on Pine Street/Centech Boulevard. The southern site driveway was positioned at the apex of the horizontal curve to maximize sight lines.

The stopping sight distance (SSD) and intersection sight distance (ISD) has been calculated per AASHTO guidelines and is shown in plan and profile on the attached figures (Figures 16 to 19; dated 05/25/2021). As shown in the figures, SSD is available for vehicles travelling northbound and southbound on Pine

Street approaching both driveway locations. ISD, meeting or exceeding ASSHTO guidelines, are provided looking in both directions at the northern site driveway and looking right from the southern site driveway. Proposed landscaping along the site frontage will be modified and included on revised Site Plans to ensure that it does not conflict with the sightlines. An ISD of approximately 320 feet is available looking left from the southern site driveway with the proposed removal of vegetation outside of the 25-foot no-disturbance buffer zone before the sight line is limited by the metal beam rail, parapet, and fencing of the MBTA overpass structure. An intersection warning sign and a posted speed limit sign with radar-equipped speed monitoring display is proposed for northbound traffic approaching the southern site driveway to warn vehicles of potential exiting traffic. The signs will be further discussed with the Town.

Future Conditions:

6. Traffic Growth:

Comment: *MDM notes that traffic associated with the Edgemere Crossing at Flint Pond development located along Route 20 in Shrewsbury may further impact the Route 20/Centech Boulevard/ Cherry Street intersection beyond the 0.5% annualized growth factor and background projects cited in the TIS. This approved development project is projected to generate approximately 30% of its 600+ peak period trips along Route 20 in the Centech Boulevard vicinity and should be factored into future year analysis and signal optimization calculations presented in the TIS.*

Response: As requested, the site-generated volumes from the approved "Edgemere Crossing at Flint Pond Development, Supplemental Response to Transportation Peer Review Comments", dated December 19, 2019 were added to the 2027 No Build and Build traffic volumes in addition to the 0.5% annual growth rate. The additional traffic does not significantly impact the results of the analyses and the analyses show that traffic signal timing optimization (if required based on development and traffic volumes in the future) can improve 2027 Build operation to similar or better than 2027 No-Build Conditions.

In addition, it is important to note that the Route 20 at Route 140 interchange, the easternmost study area intersection in the Edgemere Crossing traffic analyses, is located approximately one mile west of the Route 20 at Centech Boulevard intersection with a relatively small proportion of traffic continuing to the east on Route 20 towards the Centech Boulevard intersection. As such, the traffic analyses including the Edgemere Crossing volumes in the 2027 No-Build and Build Conditions is considered conservative.

Recommendations/ Conclusions:

11. Pedestrian Improvements:

Comment a: *The Permit Drawing Set does not identify a crosswalk across Pine Street at the northerly driveway; such crossing would be most proximate to the residential building and would be along a primary desire line connecting residents to the nearby MBTA station. This crosswalk and associated RRFB equipment should be shown on the Permit Plan Set.*

Response: The proposed crosswalk at the northern site driveway is shown on the revised Permit Drawing Set, dated April 30, 2021. RRFB equipment will be proposed at both pedestrian crossings and further discussed with the Town.

Comment b: *The crosswalk across Pine Street at the southerly driveway should be carefully evaluated relative to sight lines/ visibility to oncoming vehicles traveling northbound. Consider placement south of the driveway to enhance visibility. Placement north of the driveway raises concern with potential pedestrian conflict with motorists exiting right from the driveway that are visually focused on high speed traffic traveling north (i.e., are looking away from the crosswalk) when beginning their turn maneuver. Associated RRFB equipment should be shown on the Permit Plan Set.*

Response: The crosswalk is proposed on the north side of the southern site driveway to eliminate the need for pedestrians to cross both Pine Street and the site traffic entering and exiting the driveway. The north side of the site driveway also locates it further away from the sight line obstructions caused by the rail on the MBTA overpass and the vegetation in the no disturbance buffer zone. The location of the crossing also provides a more direct route for pedestrians traveling between the train station and the development. As mentioned in the response to comment a, RRFB equipment will be proposed at both pedestrian crossings and further discussed with the Town.

Comment c: *Approaching sight lines to/ from the southerly crosswalk location should be shown to confirm the proposed location meets applicable SSD and ISD sight line criteria based on 85th percentile travel speeds as updated per Comment No. 4.*

Response: As noted in response in Section 5, stopping sight distance, exceeding AASHTO guidelines, is provided in both directions approaching both site driveway intersections/crossing locations.

Comment d: *Applicant should consider placement of radar-equipped speed advisory signs along Pine Street in advance of the proposed driveways to reinforce lower travel speeds; this is particularly important for the southerly driveway and pedestrian crossing that would provide an additional means of enhancing pedestrian safety along Pine Street.*

Response: As noted in the response in Section 5, speed limit signs with radar-equipped speed feedback display will be proposed and discussed further with the Town.

Access/ Circulation Comments:

12. Access/Site Circulation:

Comment a: *Applicant should confirm that the site layout provides sufficient maneuvering to accommodate the Town's largest responding fire apparatus (ladder truck) and service vehicles by conducting Autoturn vehicle turn analysis/ exhibits.*

Response: A Fire Truck Turning Template and Fire Department Connection Locations (Figure 1; dated 2/26/2021) has been submitted to the Town showing the requested analysis. Tighe & Bond is coordinating with the Grafton Fire Department to receive approval on the fire truck maneuverability on site.

Comment c: *Signs, pavement markings and traffic controls as proposed by Applicant within public way should conform to the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).*

Response: Proposed signage, pavement markings, and traffic control devices within the Town of Grafton right-of-way will conform to the Manual of Uniform Traffic Control Devices (MUTCD), latest edition.

Transportation Demand Management (TDM) Programming:

13. TDM Programming:

Comment: *MDM recommends that the applicant identify a Transportation Demand Management (TDM) program for the Site to promote alternative alternatives to single occupant vehicle (SOV) travel. Elements of a TDM program may include but are not limited to bicycle accommodations within the property including secure/ weather protected bicycle storage for residents; visitor bike parking; resident "bike share" program; provision of limited period subsidized T passes for new residents to encourage use of public transportation; unbundled parking (i.e., separate monthly charge for access to parking); provision of carshare spaces; preferential parking for carpool users (for commercial building tenants); and Transportation Options Manual for tenants that identify public transportation routes and schedules, area bicycle amenities/ bike share programming, and transportation options including ride matching available through the Commonwealth's massridematch.org web resource.*

Response: As detailed in Section 4.2 of the TIAS, the development is transit-oriented with the MBTA train station located just to the south of the site across Pine Street. The proximity of the development to the MBTA station is a significant factor in reducing site trips as the proximity aims to encourage commuter rail ridership among residents of the new apartments while reducing SOV trips. The nearby MBTA Commuter Rail Line is expected to provide a primary option for residents who would like to utilize transit for their commute and is considered an integral component of the development.

The development includes sidewalks within the site and along the site frontage and proposed pedestrian crossings at both site driveway locations with warning signage and pedestrian actuated warning devices, providing direct and safe connections from the development to the station. In addition, a bike storage room will be provided in the residential parking garage. Finally, the proposed surface lot at the retail building will serve as a parking option for MBTA users for a monthly fee.

We look forward to discussing our responses to these comments further. Please contact us if you have any questions.

TIGHE & BOND, INC.

Jean E Christy, PE
Senior Engineer

Christopher O. Granatini, PE
Vice President

Enclosures: Revised Traffic Volume Figures (Figures 5 to 7 and 13 to 15)
Revised Capacity Analysis Summary Tables (Tables 4 and 5)
Sight Lane Plan and Profile (Figures 16 to 19, Dated 05/25/2021)
Fire Truck Turning Template and Fire Department Connection Locations (Figure 1; dated 2/26/2021)
Revised Capacity Analysis Worksheets

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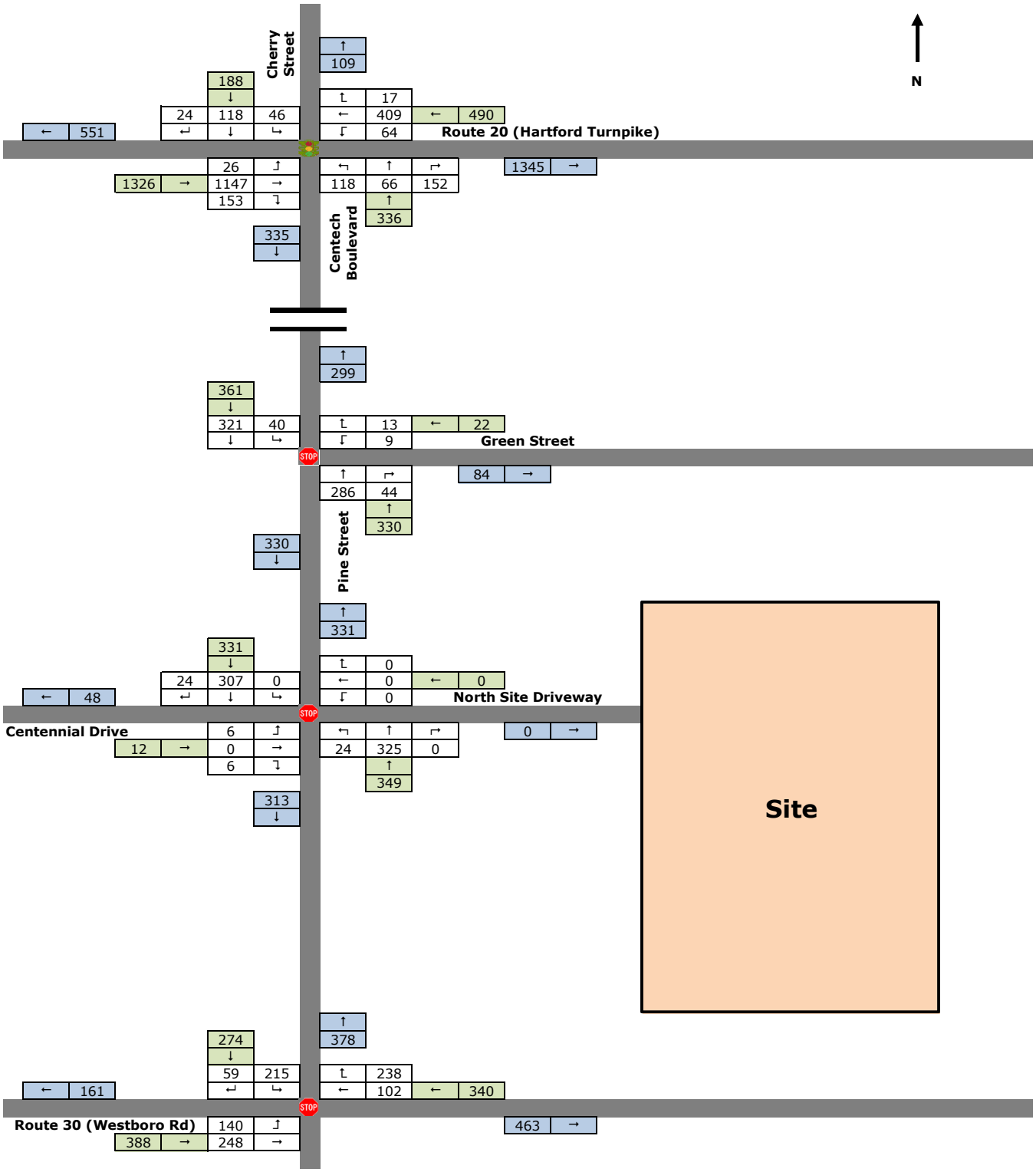
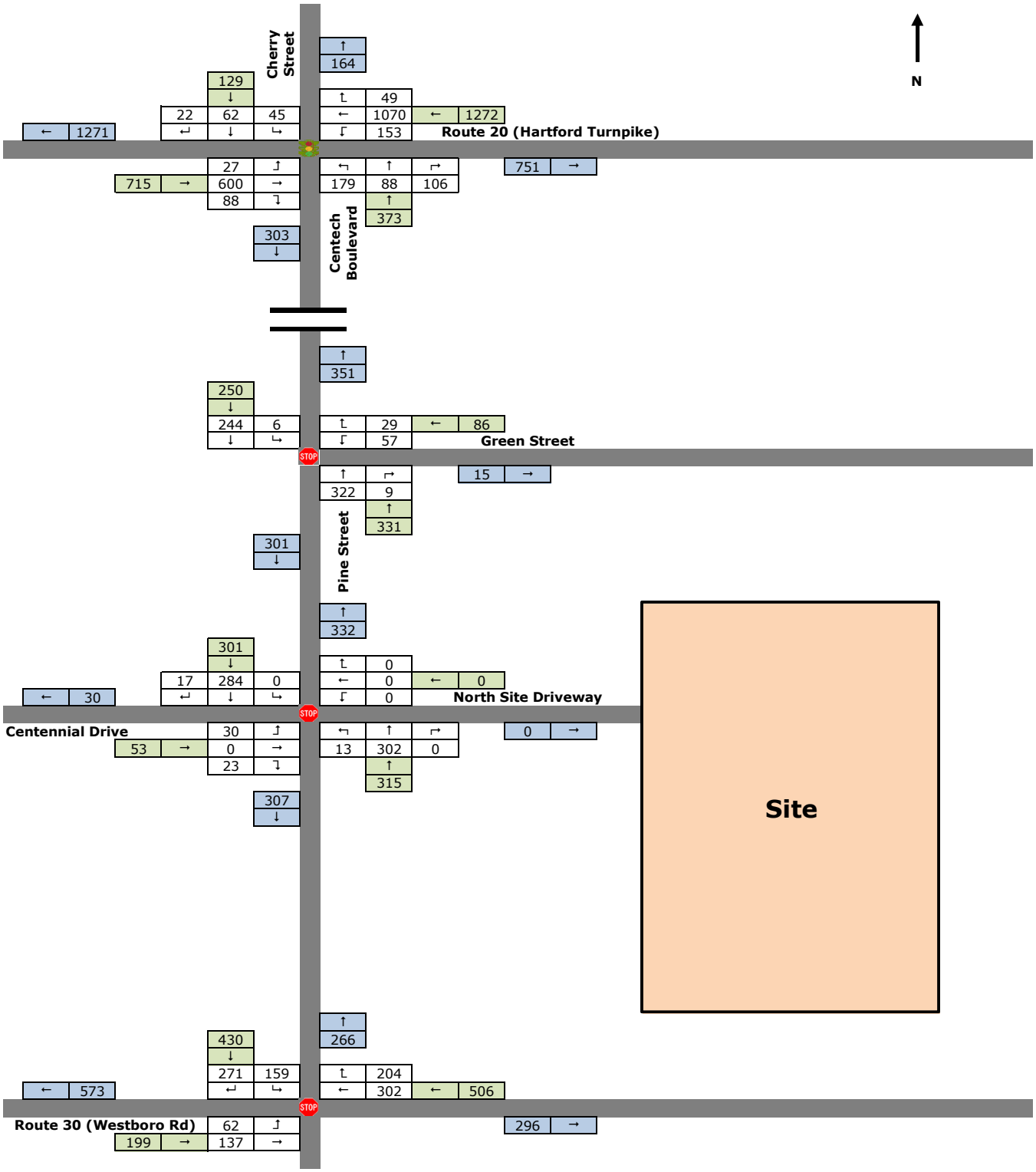


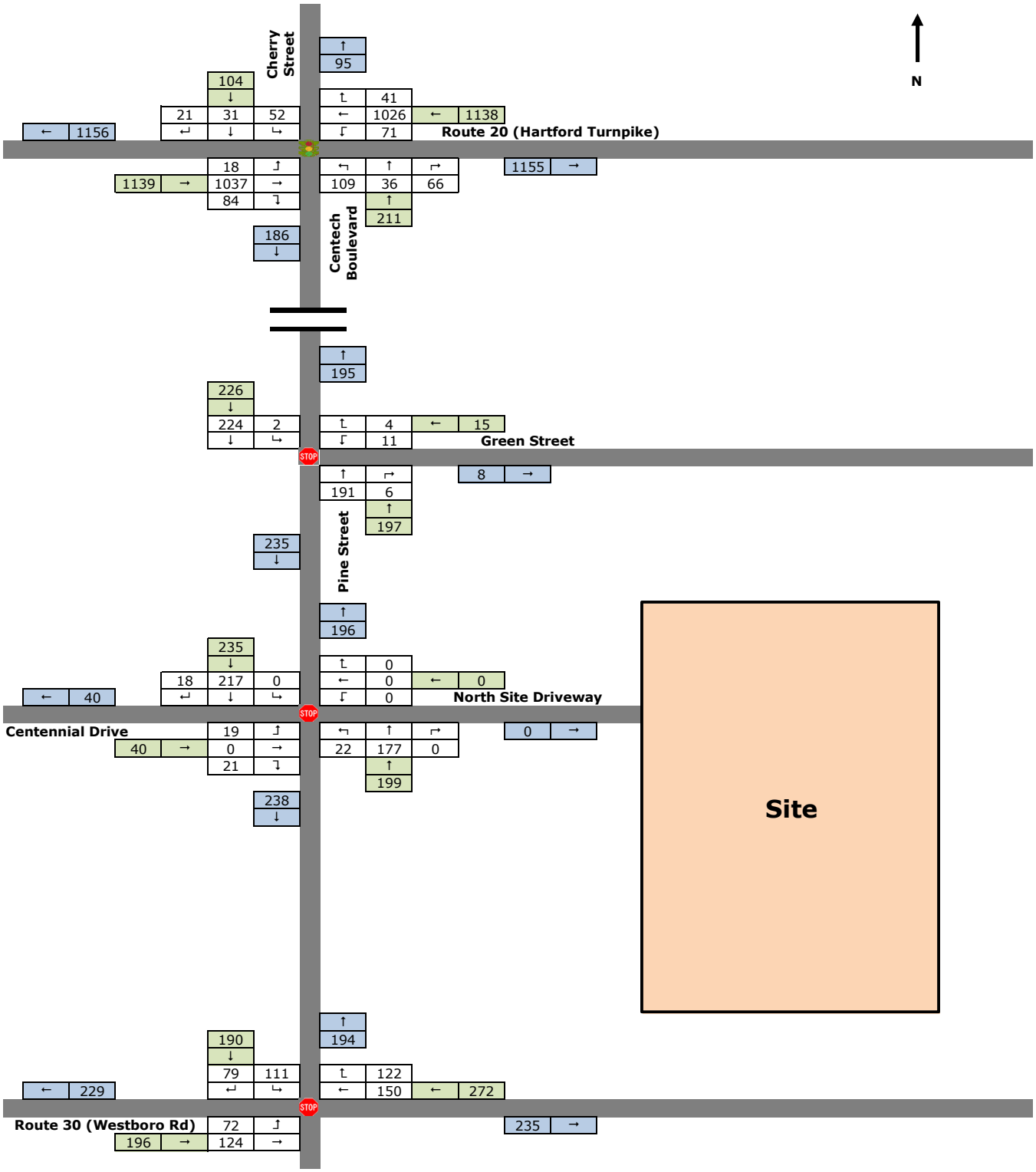
2027 No-Build Traffic Volumes
Village at Grafton Woods
Weekday Morning Peak Hour

Figure 5



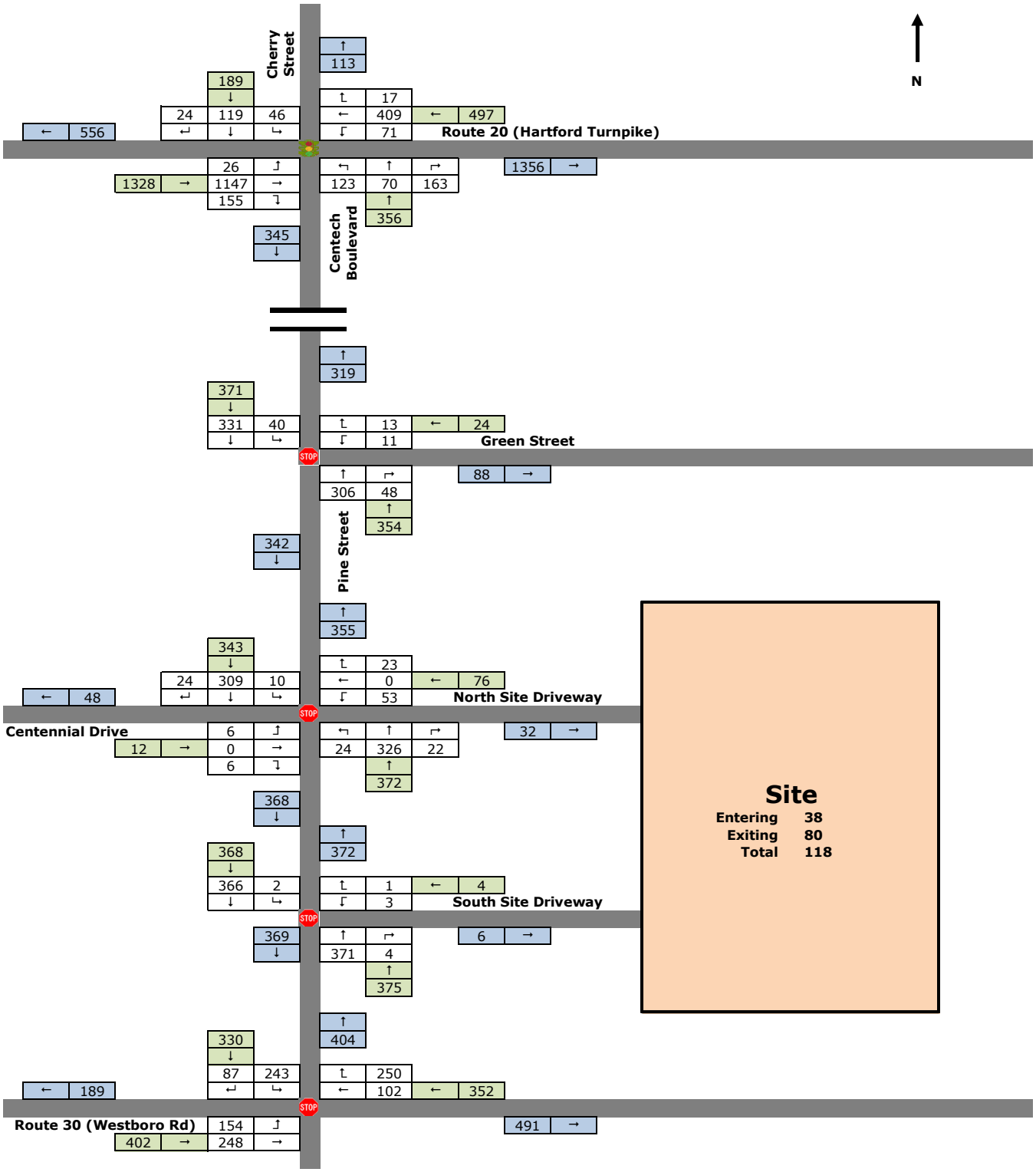
2027 No-Build Traffic Volumes
Village at Grafton Woods
Weekday Afternoon Peak Hour

Figure 6



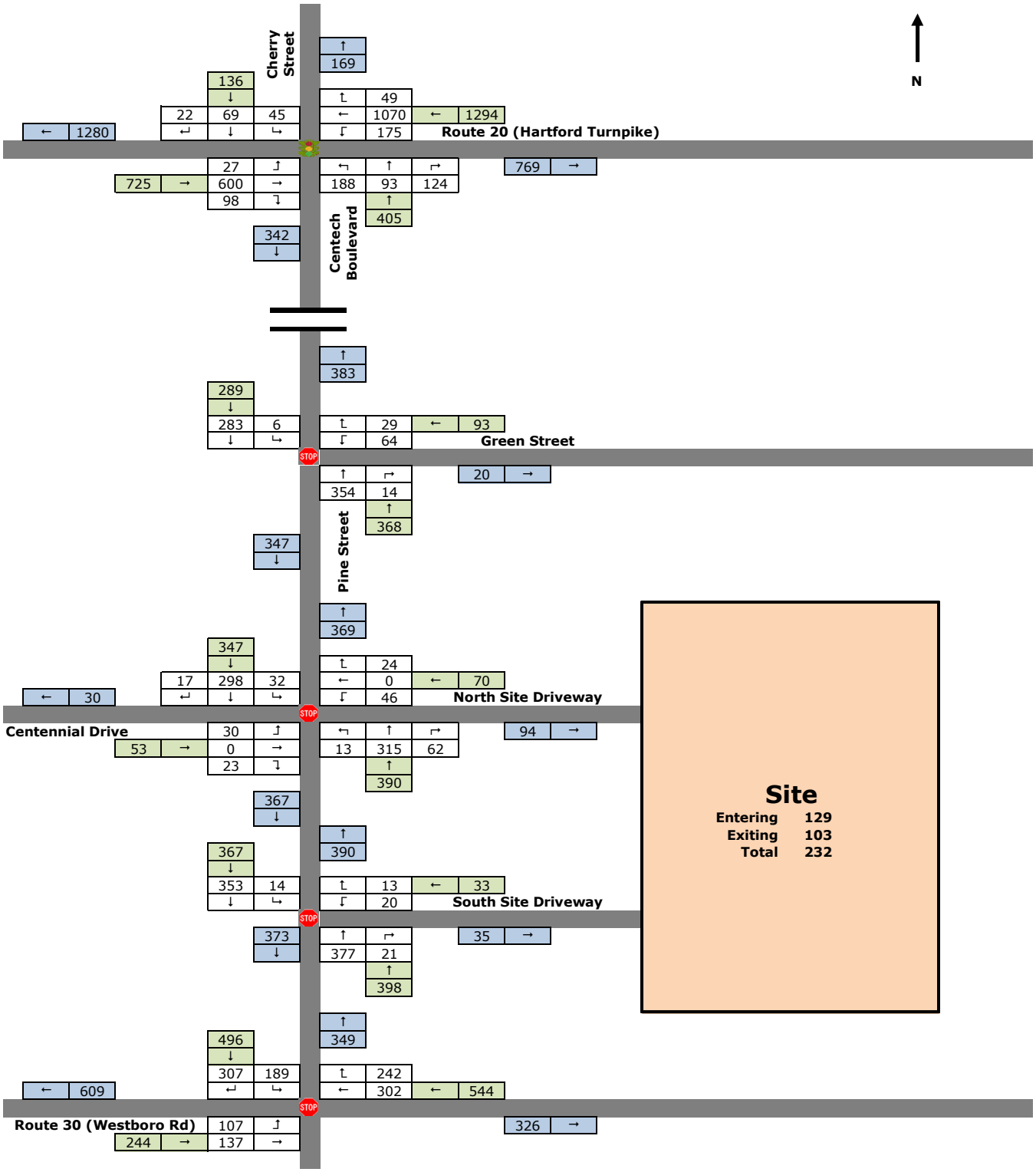
2027 No-Build Traffic Volumes
Village at Grafton Woods
Saturday Midday Peak Hour

Figure 7



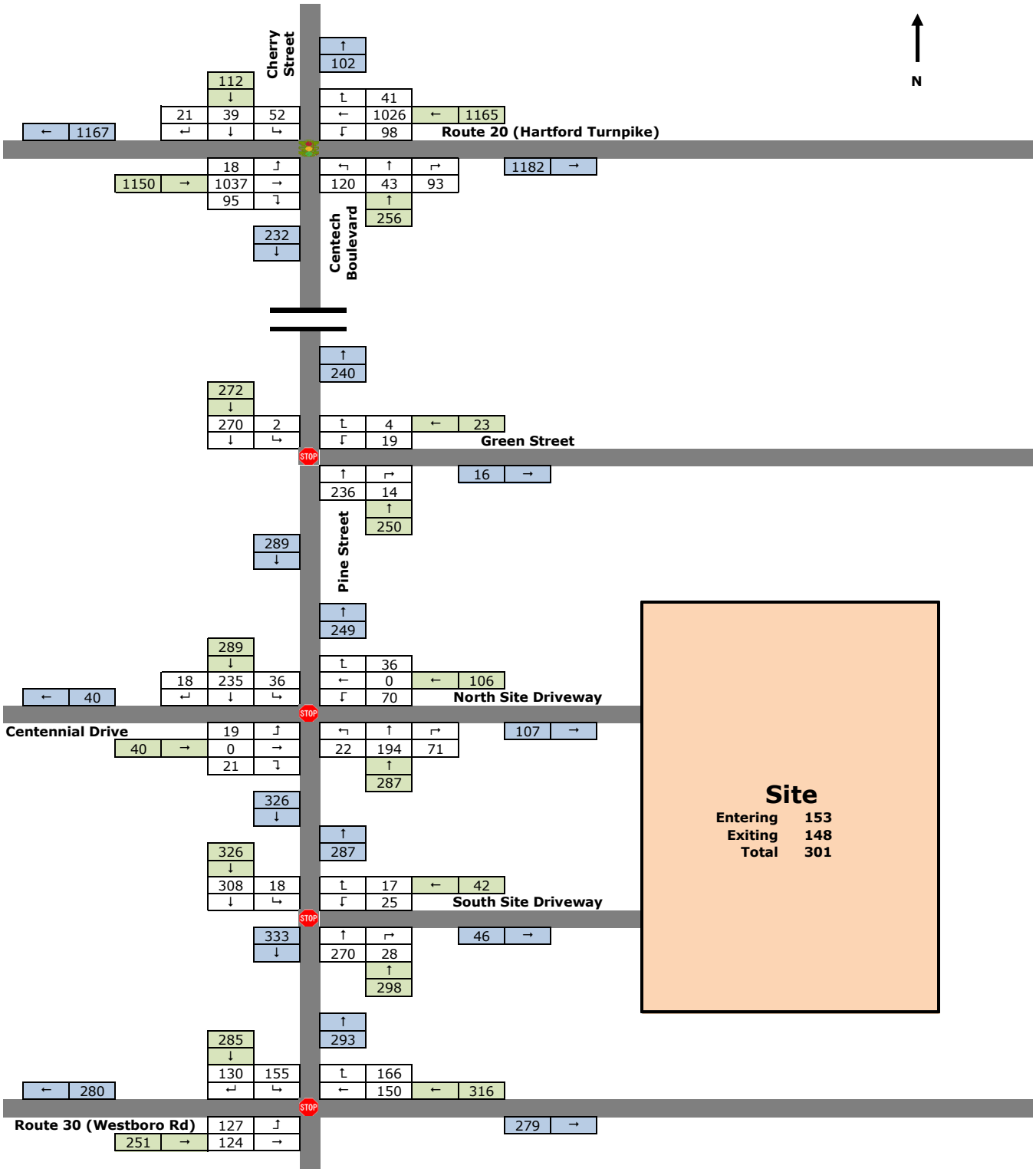
2027 Build Traffic Volumes
Village at Grafton Woods
Weekday Morning Peak Hour

Figure 13



2027 Build Traffic Volumes
Village at Grafton Woods
Weekday Afternoon Peak Hour

Figure 14



2027 Build Traffic Volumes
Village at Grafton Woods
Saturday Midday Peak Hour

Figure 15

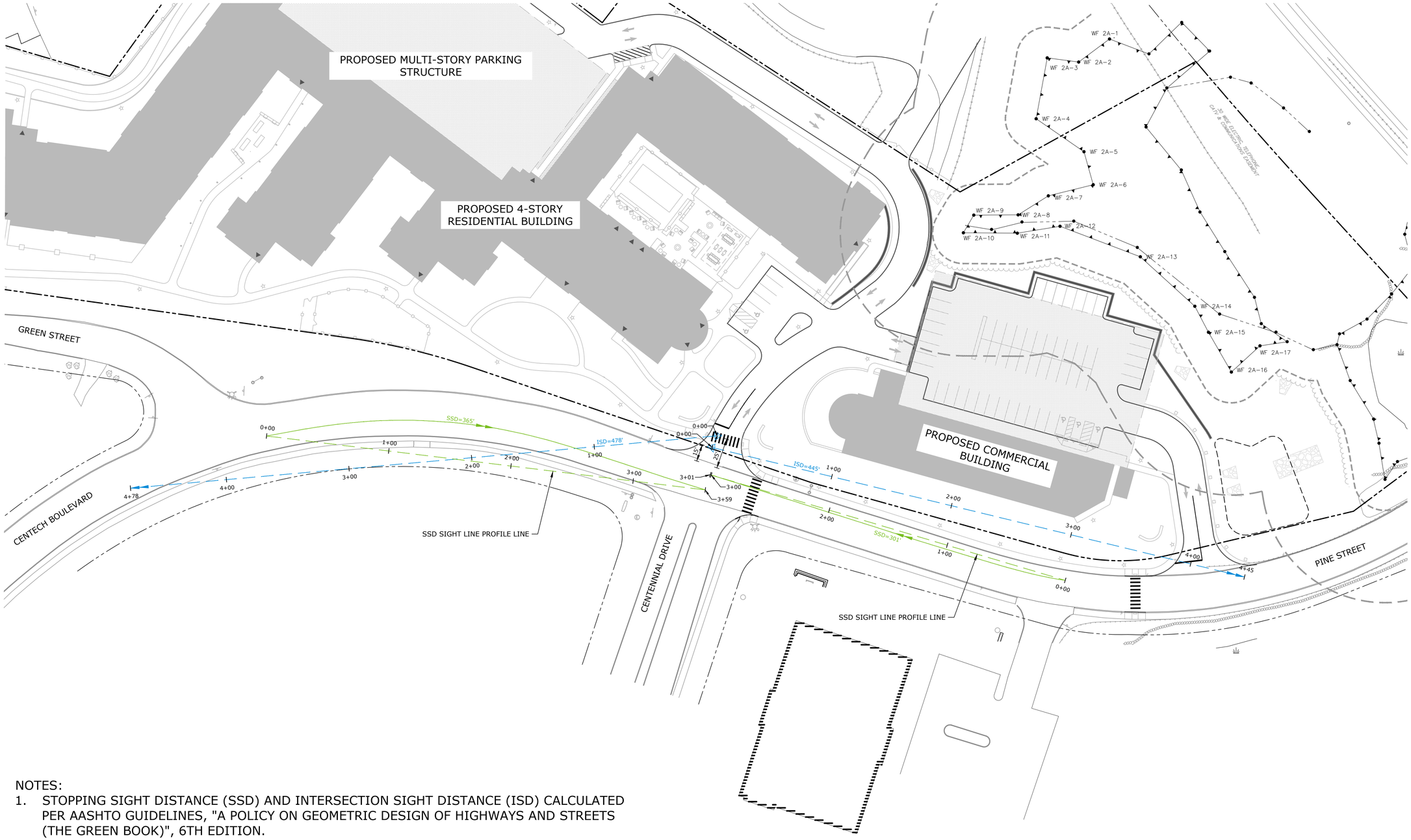
TABLE 4
Intersection Operation Summary - Vehicular Levels of Service / Average Delay (sec/veh)

		Weekday Morning Peak Hour				Weekday Afternoon Peak Hour				Saturday Midday Peak Hour			
	Lane Use	**2020 Existing**	**2027 No-Build**	**2027 Build**	**2027 Optimized**	**2020 Existing**	**2027 No-Build**	**2027 Build**	**2027 Optimized**	**2020 Existing**	**2027 No-Build**	**2027 Build**	**2027 Optimized**
Unsignalized TWSC - Route 30 (Westboro Road) at Pine Street													
Route 30 (Westboro Road)	EBL	A / 8.5	A / 8.8	A / 8.9	-- / --	A / 8.5	A / 8.8	A / 9.1	-- / --	A / 7.8	A / 8.0	A / 8.2	-- / --
Pine Street	SBL	D / 33.3	F / 62.9	F / 109.0	-- / --	C / 15.3	C / 18.2	D / 26.1	-- / --	B / 11.7	B / 13.4	C / 17.6	-- / --
	SBR	A / 8.9	A / 9.3	A / 9.5	-- / --	B / 12.3	B / 13.2	B / 13.9	-- / --	A / 9.1	A / 9.4	A / 9.8	-- / --
Unsignalized TWSC - Pine Street/Centech Blvd at Centennial Drive/Northern Site Driveway													
Pine Street	NBL	A / 8.2	A / 8.4	A / 8.4	-- / --	A / 7.9	A / 8.0	A / 8.0	-- / --	A / 7.6	A / 7.8	A / 7.8	-- / --
Centennial Drive	EBL	C / 16.3	C / 17.9	C / 22.8	-- / --	B / 13.5	C / 15.0	C / 21.1	-- / --	B / 10.8	B / 12.0	C / 16.1	-- / --
	EBR	B / 10.5	B / 10.8	B / 10.9	-- / --	B / 10.1	B / 10.4	B / 10.5	-- / --	A / 9.3	A / 9.6	A / 9.8	-- / --
Northern Site Driveway	WBLR	-- / --	-- / --	C / 23.5	-- / --	-- / --	-- / --	C / 18.5	-- / --	-- / --	-- / --	C / 16.2	-- / --
Centech Blvd	SBL	-- / --	-- / --	A / 8.4	-- / --	-- / --	-- / --	A / 8.2	-- / --	-- / --	-- / --	A / 7.9	-- / --
Unsignalized TWSC - Centech Blvd at Green Street													
Green Street	WBL	B / 13.2	B / 13.9	B / 14.9	-- / --	B / 12.9	B / 13.9	C / 15.3	-- / --	B / 10.3	B / 10.9	B / 12.0	-- / --
Centech Blvd	SBL	A / 8.3	A / 8.4	A / 8.5	-- / --	A / 7.9	A / 8.0	A / 8.1	-- / --	A / 7.6	A / 7.6	A / 7.8	-- / --
Unsignalized TWSC - Pine Street at Southern Site Driveway													
Southern Site Driveway	WBL	-- / --	-- / --	C / 15.8	-- / --	-- / --	-- / --	C / 16.5	-- / --	-- / --	-- / --	B / 13.0	-- / --
Pine Street	SBL	-- / --	-- / --	A / 8.4	-- / --	-- / --	-- / --	A / 8.4	-- / --	-- / --	-- / --	A / 8.0	-- / --
Traffic Signal - Route 20 (Hartford Turnpike) at Centech Blvd/Cherry Street													
Overall		**C / 29.1**	**C / 34.8**	**D / 37.3**	**C / 34.9**	**D / 38.7**	**E / 72.7**	**F / 90.0**	**D / 46.7**	**C / 21.9**	**C / 31.2**	**C / 33.5**	**C / 32.3**
Route 20 (Hartford Turnpike	EBL	A / 5.2	A / 5.3	A / 5.3	A / 8.3	A / 4.5	A / 6.0	A / 6.1	B / 10.7	A / 5.6	A / 5.8	A / 5.8	A / 6.6
	EBTR	C / 23.4	C / 30.0	C / 30.5	D / 40.8	B / 10.3	B / 10.2	B / 10.6	B / 11.4	B / 13.1	B / 14.3	B / 15.0	B / 13.5
	WBL	A / 9.9	B / 13.5	B / 15.4	C / 24.9	A / 4.9	A / 5.0	A / 5.4	A / 9.6	A / 5.8	A / 6.4	A / 7.5	A / 9.5
	WBTR	B / 13.3	B / 14.9	B / 14.9	B / 18.6	C / 23.1	C / 33.8	C / 33.8	D / 54.7	C / 28.3	D / 49.5	D / 54.6	D / 54.0
Centech Blvd	NBLT	F / 94.9	F / 115.5	F / 134.2	D / 54.8	F / 160.0	F / 276.7	F / 332.6	F / 129.2	D / 46.0	D / 46.7	D / 49.3	D / 44.6
	NBR	C / 22.4	C / 23.1	C / 23.4	C / 20.2	C / 31.6	C / 32.9	C / 32.9	D / 35.5	B / 19.4	B / 19.6	C / 20.2	C / 21.4
Cherry Street	SBLT	D / 50.9	E / 60.1	E / 67.1	C / 33.5	F / 104.5	F / 530.6	F / 750.1	E / 61.1	D / 35.0	D / 35.7	D / 36.8	C / 33.8
	SBR	B / 19.7	B / 19.8	B / 19.8	B / 15.9	C / 31.6	C / 32.1	C / 32.1	C / 31.8	B / 19.6	B / 19.7	B / 19.9	B / 19.6

TABLE 5

Intersection Operation Summary - Vehicular 50th / 95th Percentile Queue (In Feet)

	Lane Use	Available Storage	Weekday Morning Peak Hour				Weekday Afternoon Peak Hour				Saturday Midday Peak Hour			
			2020 Existing	2027 No-Build	2027 Build	2027 Optimized	2020 Existing	2027 No-Build	2027 Build	2027 Optimized	2020 Existing	2027 No-Build	2027 Build	2027 Optimized
Unsignalized TWSC - Route 30 (Westboro Road) at Pine Street														
Route 30 (Westboro Road)	EBL	275	10	13	15	-- / --	3	5	10	-- / --	3	5	10	-- / --
Pine Street	SBL	500+	123	198	293	-- / --	33	45	78	-- / --	15	20	40	-- / --
	SBR	65	3	8	10	-- / --	38	48	57	-- / --	5	8	13	-- / --
Unsignalized TWSC - Pine Street/Centech Blvd. at Centennial Drive/Northern Site Driveway														
Pine Street	NBL	500+	3	3	3	-- / --	0	0	0	-- / --	0	3	3	-- / --
Centennial Drive	EBL	500+	3	3	3	-- / --	3	8	10	-- / --	0	3	5	-- / --
	EBR	500+	0	0	0	-- / --	3	3	3	-- / --	0	3	3	-- / --
Northern Site Driveway	WBLR	50	-- / --	-- / --	30	-- / --	-- / --	-- / --	20	-- / --	-- / --	-- / --	28	-- / --
Centech Blvd	SBL	500+	-- / --	-- / --	0	-- / --	-- / --	-- / --	3	-- / --	-- / --	-- / --	3	-- / --
Unsignalized TWSC - Centech Blvd. at Green Street														
Green Street	WBL	500+	5	5	8	-- / --	15	18	23	-- / --	3	3	3	-- / --
Centech Blvd	SBL	500+	3	3	3	-- / --	0	0	0	-- / --	0	0	0	-- / --
Unsignalized TWSC - Pine Street at Southern Site Driveway														
Southern Site Driveway	WBL	100	-- / --	-- / --	0	-- / --	-- / --	-- / --	8	-- / --	-- / --	-- / --	8	-- / --
Pine Street	SBL	500+	-- / --	-- / --	0	-- / --	-- / --	-- / --	3	-- / --	-- / --	-- / --	0	-- / --
Traffic Signal - Route 20 (Hartford Turnpike) at Centech Blvd/Cherry Street														
Route 20 (Hartford Turnpik	EBL	250	5 / 12	5 / 12	5 / 12	6 / 17	4 / 10	4 / 10	4 / 10	6 / 15	3 / 10	3 / 10	3 / 10	3 / 11
	EBTR	500+	315 / 374	381 / 447	362 / 423	395 / 557	90 / 128	111 / 155	114 / 165	130 / 166	167 / 255	204 / 303	220 / 307	196 / 299
	WBL	350	12 / 23	13 / 32	14 / 40	17 / 54	23 / 38	25 / 41	29 / 47	42 / 68	10 / 25	10 / 26	16 / 33	15 / 38
	WBTR	500+	135 / 194	176 / 249	148 / 212	187 / 293	498 / 755	749 / 1140	749 / 1138	984 / 1243	450 / 807	667 / 973	695 / 973	663 / 983
Centech Blvd	NBLT	500+	115 / 234	132 / 247	145 / 262	110 / 178	261 / 434	282 / 457	309 / 487	264 / 440	71 / 135	73 / 140	85 / 160	83 / 148
	NBR	375	65 / 106	72 / 115	78 / 123	70 / 111	59 / 106	63 / 110	74 / 124	79 / 135	24 / 53	25 / 54	36 / 72	37 / 73
Cherry Street	SBLT	500+	96 / 179	102 / 195	104 / 204	88 / 141	86 / 204	127 / 246	144 / 266	86 / 169	39 / 83	40 / 86	45 / 93	44 / 88
	SBR	85	10 / 26	11 / 27	11 / 27	9 / 24	12 / 33	13 / 34	13 / 34	13 / 34	7 / 23	8 / 24	8 / 24	8 / 24



NOTES:

1. STOPPING SIGHT DISTANCE (SSD) AND INTERSECTION SIGHT DISTANCE (ISD) CALCULATED PER AASHTO GUIDELINES, "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (THE GREEN BOOK)", 6TH EDITION.

2. OPERATING SPEEDS USED TO CALCULATE ISD AND SSD BASED ON 85TH PERCENTILE SPEED OF 40 MPH IN THE NORTHBOUND DIRECTION AND 43 MPH IN THE SOUTHBOUND DIRECTION, COLLECTED BETWEEN CENTENNIAL DRIVE AND GREEN STREET IN DECEMBER 2020.

3. AVAILABLE SIGHT DISTANCE ESTIMATED USING AVAILABLE AERIAL MAPPING, EXISTING SITE SURVEY, AND PROPOSED SITE PLAN LAYOUT.

Tighe&Bond

PERMIT SET - NOT FOR CONSTRUCTION

Village at Grafton Woods

8 Pine Street

GSX-ODG, LLC

Grafton, Massachusetts

MARK	DATE	DESCRIPTION

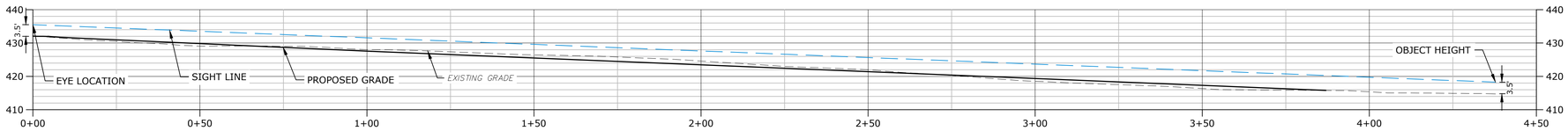
PROJECT NO:	O0120013A
DATE:	05/25/2021
FILE:	240120-013A-C-Sight Distances.dwg
DRAWN BY:	MS
CHECKED BY:	JEC
APPROVED BY:	COG

NORTHERN SITE DRIVEWAY SIGHT DISTANCES

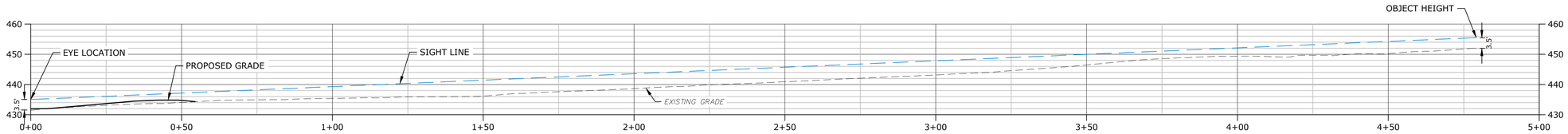
SCALE: 1" = 40'

FIGURE 16

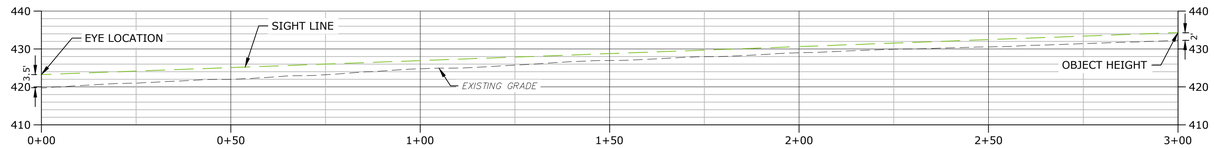
Last Saved: 5/27/2021
Plotted On: May 27, 2021 - 4:39pm By: MStoutz
Tighe & Bond: J:\O\O0120 OConnell\013 Village at Grafton Woods\Drawings_Figures\AutoCAD\Sheet\Permit Drawings\240120-013A-C-Sight Distances.dwg



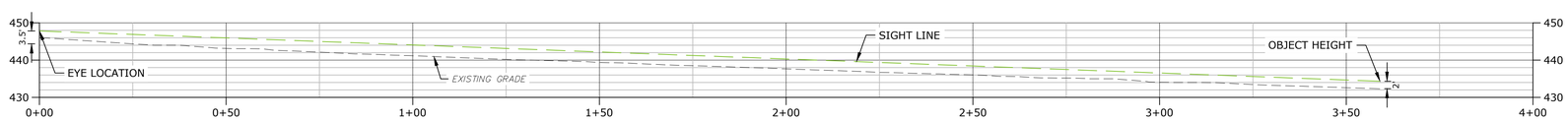
NORTHERN SITE DRIVEWAY ISD (LOOKING LEFT - SOUTH)



NORTHERN SITE DRIVEWAY ISD (LOOKING RIGHT - NORTH)



NORTHERN SITE DRIVEWAY SSD (NORTHBOUND)



NORTHERN SITE DRIVEWAY SSD (SOUTHBOUND)

NOTES:

1. STOPPING SIGHT DISTANCE (SSD) AND INTERSECTION SIGHT DISTANCE (ISD) CALCULATED PER AASHTO GUIDELINES, "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (THE GREEN BOOK)", 6TH EDITION.

2. OPERATING SPEEDS USED TO CALCULATE ISD AND SSD BASED ON 85TH PERCENTILE SPEED OF 40 MPH IN THE NORTHBOUND DIRECTION AND 43 MPH IN THE SOUTHBOUND DIRECTION, COLLECTED BETWEEN CENTENNIAL DRIVE AND GREEN STREET IN DECEMBER 2020.

3. AVAILABLE SIGHT DISTANCE ESTIMATED USING AVAILABLE AERIAL MAPPING, EXISTING SITE SURVEY, AND PROPOSED SITE PLAN LAYOUT.

0 20' 40'
SCALE: 1" = 20'

Tighe&Bond

PERMIT SET - NOT FOR CONSTRUCTION

Village at Grafton Woods
8 Pine Street

GSX-ODG, LLC

Grafton, Massachusetts

MARK	DATE	DESCRIPTION

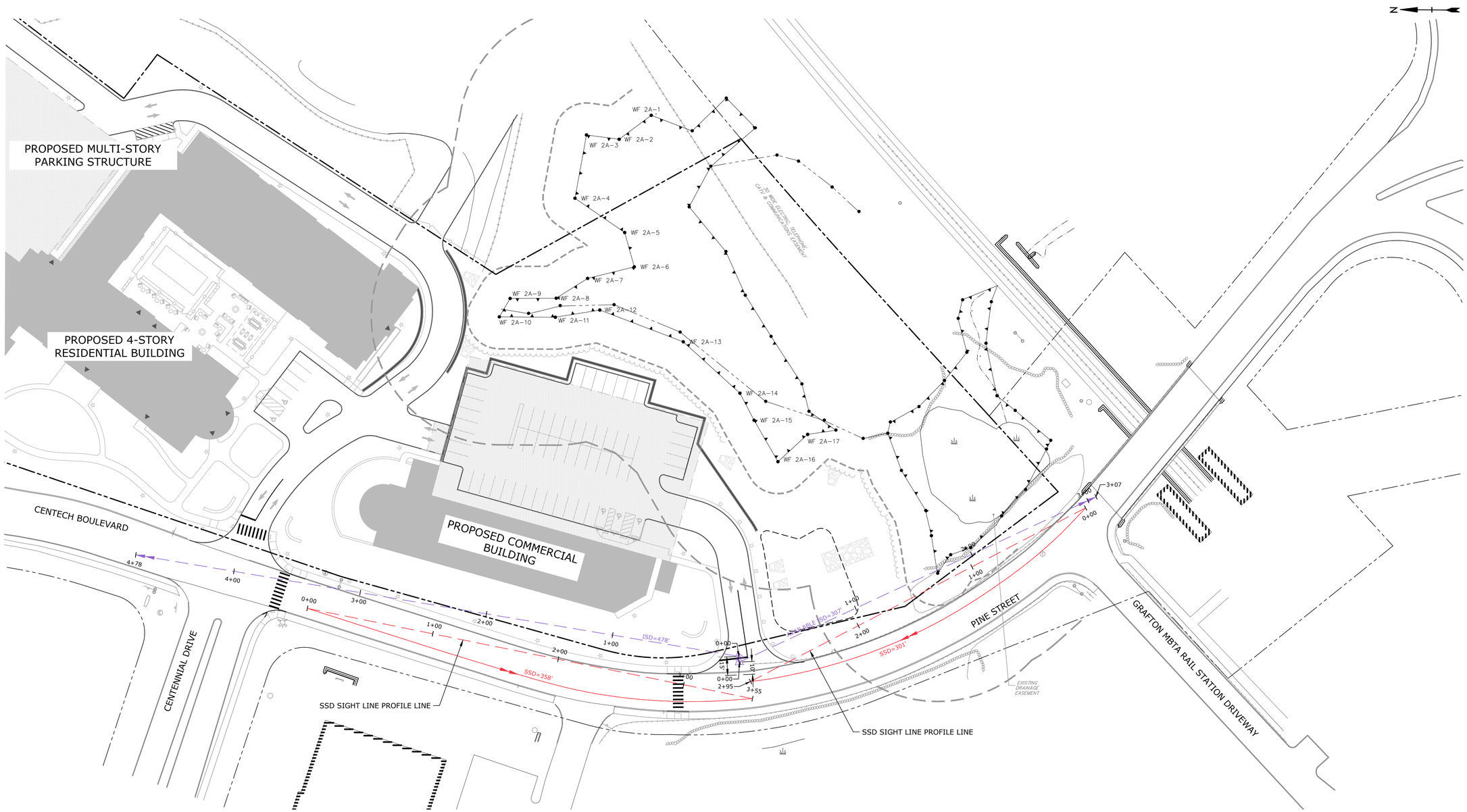
PROJECT NO:	O0120013A
DATE:	05/25/2021
FILE:	240120-013A-C-Sight Distances.dwg
DRAWN BY:	MS
CHECKED BY:	JEC
APPROVED BY:	COG

NORTHERN SITE DRIVEWAY SIGHT DISTANCE PROFILES

SCALE: 1" = 20'

FIGURE 17

Last Saved: 5/27/2021
Plotted On: May 27, 2021 - 5:05pm By: MStoutz
Tighe & Bond: J:\O\O0120 OConnell\013 Village at Grafton Woods\Drawings_Figures\AutoCAD\Sheet\Permit Drawings\240120-013A-C-Sight Distances.dwg



NOTES:

1. STOPPING SIGHT DISTANCE (SSD) AND INTERSECTION SIGHT DISTANCE (ISD) CALCULATED PER AASHTO GUIDELINES, "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (THE GREEN BOOK)", 6TH EDITION.

2. OPERATING SPEEDS USED TO CALCULATE ISD AND SSD BASED ON 85TH PERCENTILE SPEED OF 40 MPH IN THE NORTHBOUND DIRECTION AND 43 MPH IN THE SOUTHBOUND DIRECTION, COLLECTED BETWEEN CENTENNIAL DRIVE AND GREEN STREET IN DECEMBER 2020.

3. AVAILABLE SIGHT DISTANCE ESTIMATED USING AVAILABLE AERIAL MAPPING, EXISTING SITE SURVEY, AND PROPOSED SITE PLAN LAYOUT.

Tighe&Bond

PERMIT SET - NOT FOR CONSTRUCTION

Village at Grafton Woods
8 Pine Street

GSX-ODG, LLC

Grafton, Massachusetts

MARK	DATE	DESCRIPTION

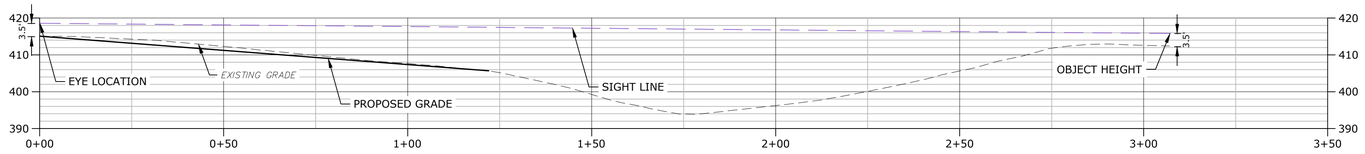
PROJECT NO:	O0120013A
DATE:	05/25/2021
FILE:	240120-013A-C-Sight Distances.dwg
DRAWN BY:	MS
CHECKED BY:	JEC
APPROVED BY:	COG

SOUTHERN SITE DRIVEWAY SIGHT DISTANCES

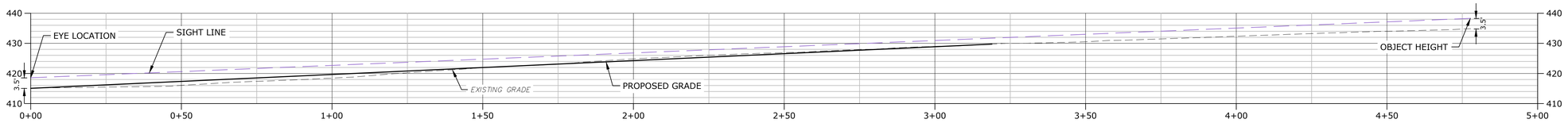
SCALE: 1" = 40'

FIGURE 18

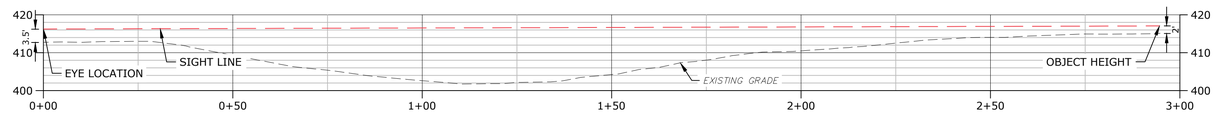
Last Saved: 5/27/2021
Plotted On: May 27, 2021 - 4:40pm By: MStoutz
Tighe & Bond: J:\O\O0120 OConnell\013 Village at Grafton Woods\Drawings_Figures\AutoCAD\Sheet\Permit Drawings\240120-013A-C-Sight Distances.dwg



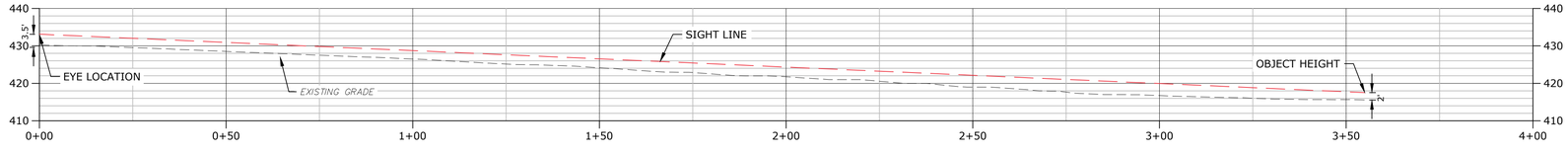
SOUTHERN SITE DRIVEWAY ISD (LOOKING LEFT - SOUTH)



SOUTHERN SITE DRIVEWAY ISD (LOOKING RIGHT - NORTH)



SOUTHERN DRIVEWAY SSD (NORTHBOUND)



SOUTHERN SITE DRIVEWAY SSD (SOUTHBOUND)

NOTES:

1. STOPPING SIGHT DISTANCE (SSD) AND INTERSECTION SIGHT DISTANCE (ISD) CALCULATED PER AASHTO GUIDELINES, "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (THE GREEN BOOK)", 6TH EDITION.

2. OPERATING SPEEDS USED TO CALCULATE ISD AND SSD BASED ON 85TH PERCENTILE SPEED OF 40 MPH IN THE NORTHBOUND DIRECTION AND 43 MPH IN THE SOUTHBOUND DIRECTION, COLLECTED BETWEEN CENTENNIAL DRIVE AND GREEN STREET IN DECEMBER 2020.

3. AVAILABLE SIGHT DISTANCE ESTIMATED USING AVAILABLE AERIAL MAPPING, EXISTING SITE SURVEY, AND PROPOSED SITE PLAN LAYOUT.

0 20' 40'
SCALE: 1" = 20'

Tighe&Bond

PERMIT SET - NOT FOR CONSTRUCTION

Village at Grafton Woods
8 Pine Street

GSX-ODG, LLC

Grafton, Massachusetts

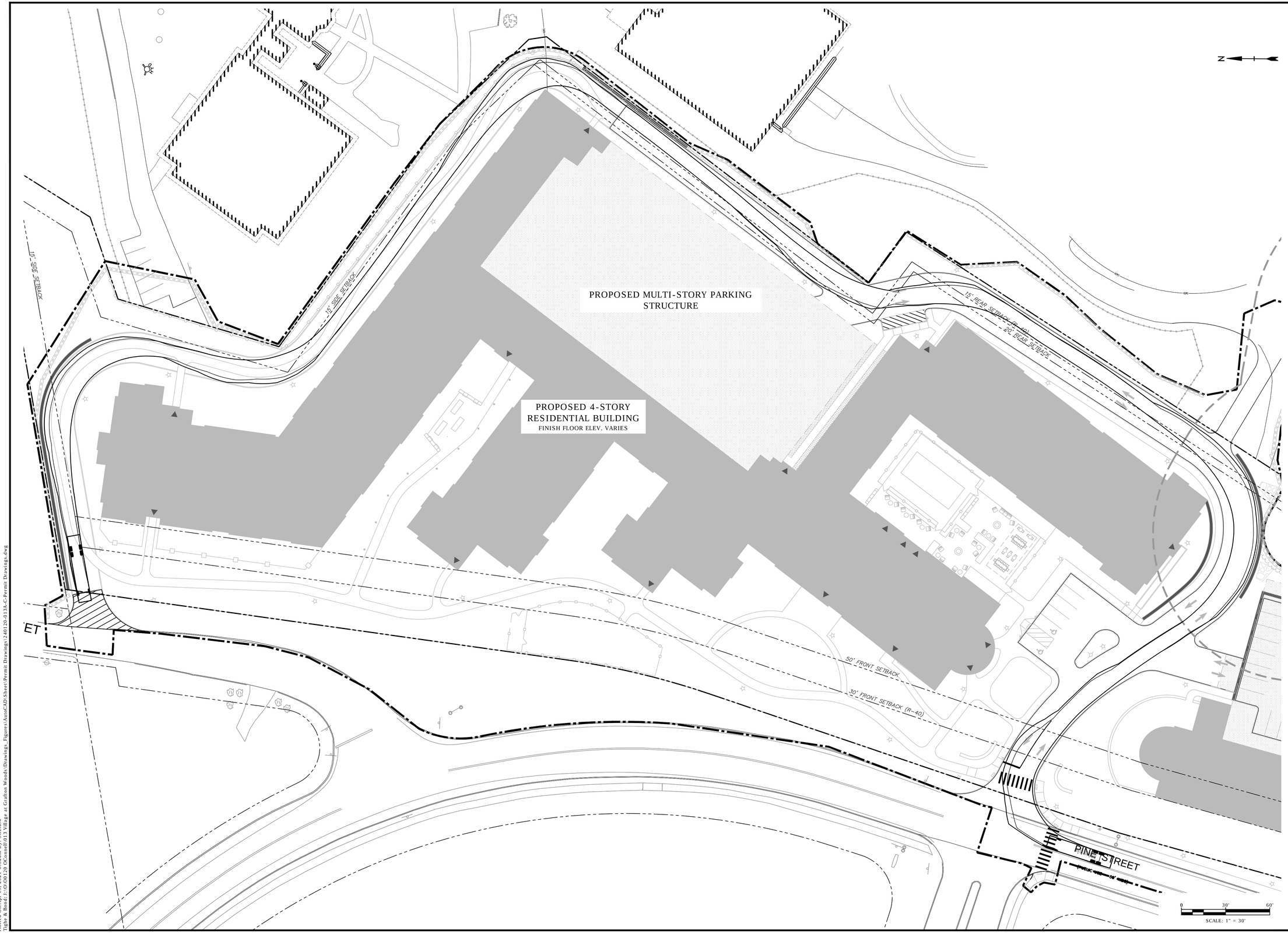
MARK	DATE	DESCRIPTION

PROJECT NO:	O0120013A
DATE:	05/25/2021
FILE:	240120-013A-C-Sight Distances.dwg
DRAWN BY:	MS
CHECKED BY:	JEC
APPROVED BY:	COG

SOUTHERN SITE DRIVEWAY SIGHT DISTANCE PROFILES

SCALE: 1" = 20'

FIGURE 19



Tighe&Bond

PERMIT SET - NOT FOR CONSTRUCTION

Village at Grafton Woods
8 Pine Street

GSX-ODG, LLC

Grafton, Massachusetts

MARK	DATE	DESCRIPTION
1	2/26/2021	PERMIT SET

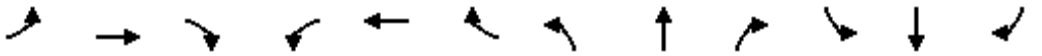
PROJECT NO:	O0120013A-07
DATE:	JANUARY 2021
FILE:	240120-013A-C-Permit Drawings.dwg
DRAWN BY:	SO / TJG
CHECKED BY:	KM
APPROVED BY:	FJH

FIRE TRUCK TURNING TEMPLATE AND FIRE DEPT CONNECTION LOCATIONS

SCALE: 1" = 30'

FIGURE 1

Last Saved: 4/19/2021
Plotted On: Apr 19, 2021 8:52am By: SOzturk
Tighe & Bond: J:\O0120 OConnell\013 Village at Grafton Woods\Drawings_Figures\AutoCAD\Sheet\Permit Drawings\240120-013A-C-Permit Drawings.dwg



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	1147	153	64	409	17	118	66	152	46	118	24
Future Volume (vph)	26	1147	153	64	409	17	118	66	152	46	118	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.982			0.994				0.850			0.850
Flt Protected	0.950			0.950				0.969			0.986	
Satd. Flow (prot)	1626	3194	0	1556	1628	0	0	1674	1468	0	1673	1442
Flt Permitted	0.418			0.080				0.576			0.681	
Satd. Flow (perm)	715	3194	0	131	1628	0	0	995	1468	0	1155	1442
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		24										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	11%	11%	11%	16%	16%	16%	10%	10%	10%	12%	12%	12%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	31	1365	182	76	487	20	140	79	181	55	140	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	1547	0	76	507	0	0	219	181	0	195	29
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	13.0	51.0		13.0	51.0		23.5	23.5	13.0	23.5	23.5	13.0
Total Split (%)	14.9%	58.3%		14.9%	58.3%		26.9%	26.9%	14.9%	26.9%	26.9%	14.9%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	51.9	45.0		55.6	50.2			18.0	30.4		18.0	29.4

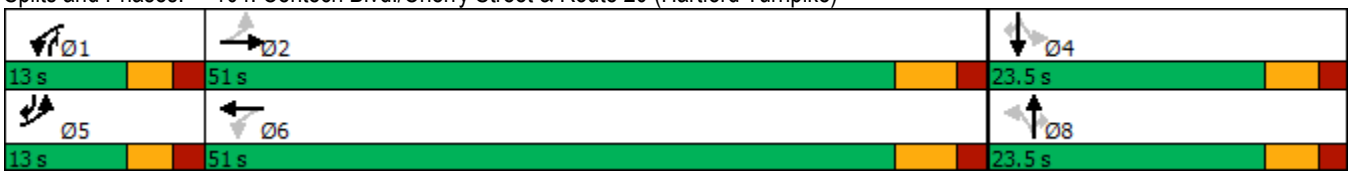
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.60	0.52		0.64	0.58			0.21	0.35		0.21	0.34
v/c Ratio	0.06	0.92		0.39	0.54			1.06	0.35		0.81	0.06
Control Delay	5.3	30.0		13.5	14.9			115.5	23.1		60.1	19.8
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	5.3	30.0		13.5	14.9			115.5	23.1		60.1	19.8
LOS	A	C		B	B			F	C		E	B
Approach Delay		29.5			14.7			73.7			54.8	
Approach LOS		C			B			E			D	
Queue Length 50th (ft)	5	381		13	176			~132	72		102	11
Queue Length 95th (ft)	12	447		32	249			#247	115		#195	27
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	531	1675		216	945			207	535		240	526
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.06	0.92		0.35	0.54			1.06	0.34		0.81	0.06

Intersection Summary			
Area Type:	Other		
Cycle Length: 87.5			
Actuated Cycle Length: 86.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.06			
Intersection Signal Delay: 34.8		Intersection LOS: C	
Intersection Capacity Utilization 70.5%		ICU Level of Service C	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	600	88	153	1070	49	179	88	106	45	62	22
Future Volume (vph)	27	600	88	153	1070	49	179	88	106	45	62	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.981			0.993				0.850			0.850
Flt Protected	0.950			0.950				0.968			0.979	
Satd. Flow (prot)	1687	3310	0	1736	1814	0	0	1752	1538	0	1824	1583
Flt Permitted	0.058			0.331				0.698			0.205	
Satd. Flow (perm)	103	3310	0	605	1814	0	0	1263	1538	0	382	1583
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		24										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	5%	5%	5%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	28	625	92	159	1115	51	186	92	110	47	65	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	717	0	159	1166	0	0	278	110	0	112	23
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	21.0	79.0		21.0	79.0		21.5	21.5	21.0	21.5	21.5	21.0
Total Split (%)	17.3%	65.0%		17.3%	65.0%		17.7%	17.7%	17.3%	17.7%	17.7%	17.3%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	74.2	66.7		79.7	73.2			16.1	30.1		16.1	28.0

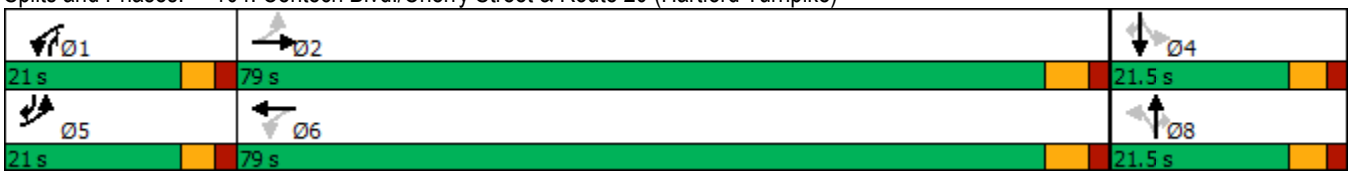
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.69	0.62		0.74	0.68			0.15	0.28		0.15	0.26
v/c Ratio	0.17	0.35		0.30	0.95			1.48	0.26		2.00	0.06
Control Delay	6.0	10.2		5.0	33.8			276.7	32.9		530.6	32.1
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	6.0	10.2		5.0	33.8			276.7	32.9		530.6	32.1
LOS	A	B		A	C			F	C		F	C
Approach Delay		10.1			30.3			207.6			445.7	
Approach LOS		B			C			F			F	
Queue Length 50th (ft)	4	111		25	749			~282	63		~127	13
Queue Length 95th (ft)	10	155		41	#1140			#457	110		#246	34
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	313	2256		624	1232			188	536		56	552
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.09	0.32		0.25	0.95			1.48	0.21		2.00	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 121.5			
Actuated Cycle Length: 107.8			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 2.00			
Intersection Signal Delay: 72.7		Intersection LOS: E	
Intersection Capacity Utilization 97.6%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	1037	84	71	1026	41	109	36	66	52	31	21
Future Volume (vph)	18	1037	84	71	1026	41	109	36	66	52	31	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.989			0.994				0.850			0.850
Flt Protected	0.950			0.950				0.964			0.970	
Satd. Flow (prot)	1770	3500	0	1752	1834	0	0	1761	1553	0	1807	1583
Flt Permitted	0.085			0.165				0.723			0.674	
Satd. Flow (perm)	158	3500	0	304	1834	0	0	1321	1553	0	1255	1583
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		14										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	4%	4%	4%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	19	1092	88	75	1080	43	115	38	69	55	33	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	1180	0	75	1123	0	0	153	69	0	88	22
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	13.0	51.0		13.0	51.0		23.5	23.5	13.0	23.5	23.5	13.0
Total Split (%)	14.9%	58.3%		14.9%	58.3%		26.9%	26.9%	14.9%	26.9%	26.9%	14.9%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	51.4	45.8		54.3	49.2			13.9	26.2		13.9	25.1

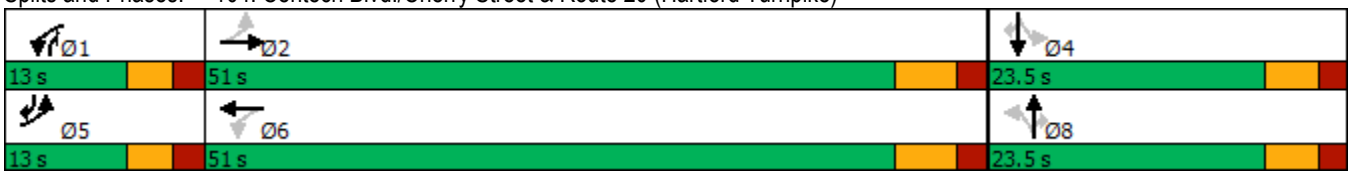
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.64	0.57		0.67	0.61			0.17	0.32		0.17	0.31
v/c Ratio	0.09	0.59		0.23	1.01			0.67	0.14		0.41	0.04
Control Delay	5.8	14.3		6.4	49.5			46.7	19.6		35.7	19.7
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	5.8	14.3		6.4	49.5			46.7	19.6		35.7	19.7
LOS	A	B		A	D			D	B		D	B
Approach Delay		14.2			46.8			38.3			32.5	
Approach LOS		B			D			D			C	
Queue Length 50th (ft)	3	204		10	~667			73	25		40	8
Queue Length 95th (ft)	10	303		26	#973			140	54		86	24
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	264	2099		350	1115			296	528		281	538
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.07	0.56		0.21	1.01			0.52	0.13		0.31	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 87.5			
Actuated Cycle Length: 80.9			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.01			
Intersection Signal Delay: 31.2		Intersection LOS: C	
Intersection Capacity Utilization 83.2%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	1147	155	71	409	17	123	70	163	46	119	24
Future Volume (vph)	26	1147	155	71	409	17	123	70	163	46	119	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.982			0.994				0.850			0.850
Flt Protected	0.950			0.950				0.969			0.986	
Satd. Flow (prot)	1626	3194	0	1556	1628	0	0	1674	1468	0	1673	1442
Flt Permitted	0.420			0.079				0.571			0.655	
Satd. Flow (perm)	719	3194	0	129	1628	0	0	986	1468	0	1111	1442
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		25										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	11%	11%	11%	16%	16%	16%	10%	10%	10%	12%	12%	12%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	31	1365	185	85	487	20	146	83	194	55	142	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	1550	0	85	507	0	0	229	194	0	197	29
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	13.0	51.0		13.0	51.0		23.5	23.5	13.0	23.5	23.5	13.0
Total Split (%)	14.9%	58.3%		14.9%	58.3%		26.9%	26.9%	14.9%	26.9%	26.9%	14.9%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	51.9	45.0		56.0	50.4			18.0	30.6		18.0	29.4

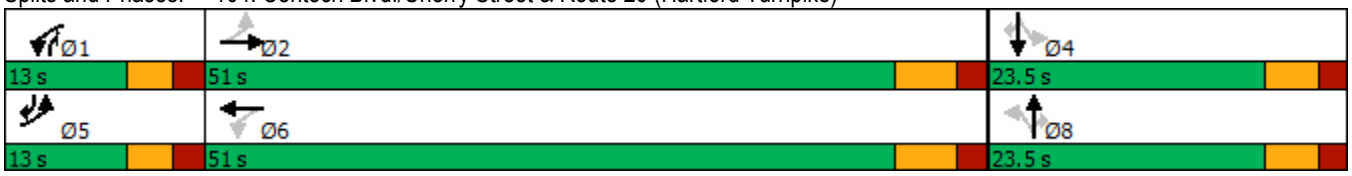
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.60	0.52		0.65	0.58			0.21	0.35		0.21	0.34
v/c Ratio	0.06	0.93		0.43	0.54			1.12	0.37		0.86	0.06
Control Delay	5.3	30.5		15.4	14.9			134.2	23.4		67.1	19.8
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	5.3	30.5		15.4	14.9			134.2	23.4		67.1	19.8
LOS	A	C		B	B			F	C		E	B
Approach Delay		30.0			14.9			83.4			61.0	
Approach LOS		C			B			F			E	
Queue Length 50th (ft)	5	384		14	176			~145	78		104	11
Queue Length 95th (ft)	12	448		40	249			#262	123		#204	27
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	532	1672		215	947			204	534		230	525
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.06	0.93		0.40	0.54			1.12	0.36		0.86	0.06

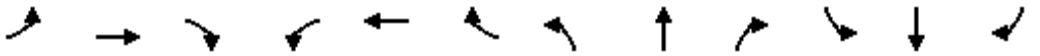
Intersection Summary			
Area Type:	Other		
Cycle Length: 87.5			
Actuated Cycle Length: 86.6			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.12			
Intersection Signal Delay: 37.3		Intersection LOS: D	
Intersection Capacity Utilization 71.5%		ICU Level of Service C	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	600	98	175	1070	49	188	93	124	45	69	22
Future Volume (vph)	27	600	98	175	1070	49	188	93	124	45	69	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.979			0.993				0.850			0.850
Flt Protected	0.950			0.950				0.968			0.981	
Satd. Flow (prot)	1687	3303	0	1736	1814	0	0	1752	1538	0	1827	1583
Flt Permitted	0.059			0.323				0.675			0.174	
Satd. Flow (perm)	105	3303	0	590	1814	0	0	1221	1538	0	324	1583
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		27										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	5%	5%	5%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	28	625	102	182	1115	51	196	97	129	47	72	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	727	0	182	1166	0	0	293	129	0	119	23
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	21.0	79.0		21.0	79.0		21.5	21.5	21.0	21.5	21.5	21.0
Total Split (%)	17.3%	65.0%		17.3%	65.0%		17.7%	17.7%	17.3%	17.7%	17.7%	17.3%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	73.5	66.0		80.3	73.3			16.1	30.7		16.1	28.0

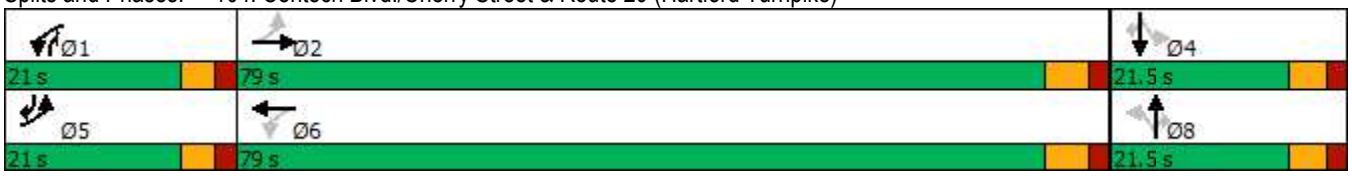
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.68	0.61		0.74	0.68			0.15	0.28		0.15	0.26
v/c Ratio	0.17	0.36		0.34	0.95			1.62	0.29		2.48	0.06
Control Delay	6.1	10.6		5.4	33.8			332.6	32.9		750.1	32.1
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	6.1	10.6		5.4	33.8			332.6	32.9		750.1	32.1
LOS	A	B		A	C			F	C		F	C
Approach Delay		10.4			29.9			241.0			633.8	
Approach LOS		B			C			F			F	
Queue Length 50th (ft)	4	114		29	749			~309	74		~144	13
Queue Length 95th (ft)	10	165		47	#1138			#487	124		#266	34
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	314	2253		614	1232			181	536		48	552
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.09	0.32		0.30	0.95			1.62	0.24		2.48	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 121.5			
Actuated Cycle Length: 107.8			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 2.48			
Intersection Signal Delay: 90.0		Intersection LOS: F	
Intersection Capacity Utilization 98.3%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	1037	95	98	1026	41	120	43	93	52	39	21
Future Volume (vph)	18	1037	95	98	1026	41	120	43	93	52	39	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.994				0.850			0.850
Flt Protected	0.950			0.950				0.964			0.972	
Satd. Flow (prot)	1770	3493	0	1752	1834	0	0	1761	1553	0	1811	1583
Flt Permitted	0.089			0.157				0.722			0.650	
Satd. Flow (perm)	166	3493	0	290	1834	0	0	1319	1553	0	1211	1583
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		16										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	4%	4%	4%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	19	1092	100	103	1080	43	126	45	98	55	41	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	1192	0	103	1123	0	0	171	98	0	96	22
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	13.0	51.0		13.0	51.0		23.5	23.5	13.0	23.5	23.5	13.0
Total Split (%)	14.9%	58.3%		14.9%	58.3%		26.9%	26.9%	14.9%	26.9%	26.9%	14.9%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	49.4	44.0		52.8	47.6			14.4	27.0		14.4	25.6

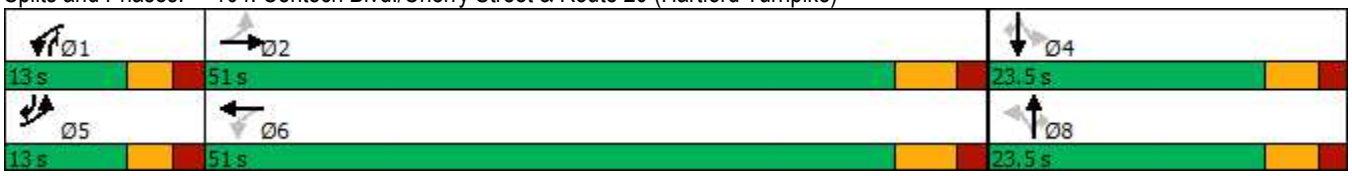
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.62	0.55		0.66	0.60			0.18	0.34		0.18	0.32
v/c Ratio	0.09	0.62		0.32	1.02			0.72	0.19		0.44	0.04
Control Delay	5.8	15.0		7.5	54.6			49.3	20.2		36.8	19.9
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	5.8	15.0		7.5	54.6			49.3	20.2		36.8	19.9
LOS	A	B		A	D			D	C		D	B
Approach Delay		14.9			50.6			38.7			33.6	
Approach LOS		B			D			D			C	
Queue Length 50th (ft)	3	220		16	~695			85	36		45	8
Queue Length 95th (ft)	10	307		33	#973			#160	72		93	24
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	270	2028		342	1096			302	547		277	558
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.07	0.59		0.30	1.02			0.57	0.18		0.35	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 87.5			
Actuated Cycle Length: 79.6			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.02			
Intersection Signal Delay: 33.5		Intersection LOS: C	
Intersection Capacity Utilization 89.1%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)

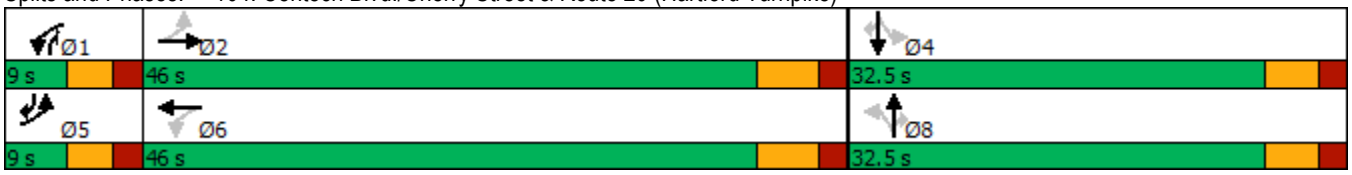


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	1147	155	71	409	17	123	70	163	46	119	24
Future Volume (vph)	26	1147	155	71	409	17	123	70	163	46	119	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.982			0.994				0.850			0.850
Flt Protected	0.950			0.950				0.969			0.986	
Satd. Flow (prot)	1626	3194	0	1556	1628	0	0	1674	1468	0	1673	1442
Flt Permitted	0.389			0.091				0.620			0.785	
Satd. Flow (perm)	666	3194	0	149	1628	0	0	1071	1468	0	1332	1442
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		22										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	11%	11%	11%	16%	16%	16%	10%	10%	10%	12%	12%	12%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	31	1365	185	85	487	20	146	83	194	55	142	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	1550	0	85	507	0	0	229	194	0	197	29
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	9.0	46.0		9.0	46.0		32.5	32.5	9.0	32.5	32.5	9.0
Total Split (%)	10.3%	52.6%		10.3%	52.6%		37.1%	37.1%	10.3%	37.1%	37.1%	10.3%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	45.2	40.2		47.4	44.1			20.9	30.4		20.9	30.4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.55	0.49		0.58	0.54			0.26	0.37		0.26	0.37
v/c Ratio	0.07	0.98		0.55	0.58			0.84	0.36		0.58	0.05
Control Delay	8.3	40.8		24.9	18.6			54.8	20.2		33.5	15.9
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	8.3	40.8		24.9	18.6			54.8	20.2		33.5	15.9
LOS	A	D		C	B			D	C		C	B
Approach Delay		40.2			19.5			38.9			31.2	
Approach LOS		D			B			D			C	
Queue Length 50th (ft)	6	395		17	187			110	70		88	9
Queue Length 95th (ft)	17	#557		#54	293			178	111		141	24
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	416	1583		155	879			355	546		442	536
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.07	0.98		0.55	0.58			0.65	0.36		0.45	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 87.5			
Actuated Cycle Length: 81.7			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.98			
Intersection Signal Delay: 34.9		Intersection LOS: C	
Intersection Capacity Utilization 71.5%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	600	98	175	1070	49	188	93	124	45	69	22
Future Volume (vph)	27	600	98	175	1070	49	188	93	124	45	69	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.979			0.993				0.850			0.850
Flt Protected	0.950			0.950				0.968			0.981	
Satd. Flow (prot)	1687	3303	0	1736	1814	0	0	1752	1538	0	1827	1583
Flt Permitted	0.053			0.340				0.692			0.467	
Satd. Flow (perm)	94	3303	0	621	1814	0	0	1252	1538	0	870	1583
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		28										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	5%	5%	5%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	28	625	102	182	1115	51	196	97	129	47	72	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	727	0	182	1166	0	0	293	129	0	119	23
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	9.0	81.5		9.0	81.5		31.0	31.0	9.0	31.0	31.0	9.0
Total Split (%)	7.4%	67.1%		7.4%	67.1%		25.5%	25.5%	7.4%	25.5%	25.5%	7.4%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	78.7	73.7		79.7	75.6			25.5	35.0		25.5	35.0

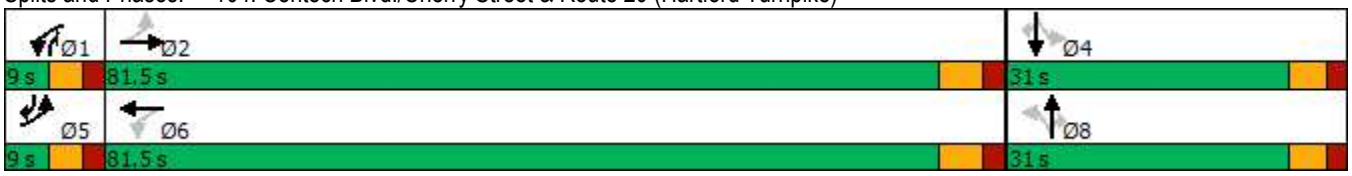
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.66	0.62		0.67	0.63			0.21	0.29		0.21	0.29
v/c Ratio	0.25	0.36		0.40	1.02			1.10	0.29		0.64	0.05
Control Delay	10.7	11.4		9.6	54.7			129.2	35.5		61.1	31.8
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	10.7	11.4		9.6	54.7			129.2	35.5		61.1	31.8
LOS	B	B		A	D			F	D		E	C
Approach Delay		11.3			48.6			100.6			56.4	
Approach LOS		B			D			F			E	
Queue Length 50th (ft)	6	130		42	~984			~264	79		86	13
Queue Length 95th (ft)	15	166		68	#1243			#440	135		#169	34
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	114	2095		451	1145			266	450		185	463
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.25	0.35		0.40	1.02			1.10	0.29		0.64	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 121.5			
Actuated Cycle Length: 119.7			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.10			
Intersection Signal Delay: 46.7		Intersection LOS: D	
Intersection Capacity Utilization 98.3%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	1037	95	98	1026	41	120	43	93	52	39	21
Future Volume (vph)	18	1037	95	98	1026	41	120	43	93	52	39	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	250		0	350		0	0		375	0		85
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	25			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.994				0.850			0.850
Flt Protected	0.950			0.950				0.964			0.972	
Satd. Flow (prot)	1770	3493	0	1752	1834	0	0	1761	1553	0	1811	1583
Flt Permitted	0.087			0.169				0.722			0.667	
Satd. Flow (perm)	162	3493	0	312	1834	0	0	1319	1553	0	1242	1583
Right Turn on Red			Yes			No			No			No
Satd. Flow (RTOR)		16										
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		507			621			702			426	
Travel Time (s)		8.6			10.6			16.0			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	4%	4%	4%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	19	1092	100	103	1080	43	126	45	98	55	41	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	1192	0	103	1123	0	0	171	98	0	96	22
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	5	2		1	6			8	1		4	5
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		8	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	4.0	12.0		4.0	12.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	18.0		9.0	18.0		9.5	9.5	9.0	9.5	9.5	9.0
Total Split (s)	9.0	52.0		9.0	52.0		26.5	26.5	9.0	26.5	26.5	9.0
Total Split (%)	10.3%	59.4%		10.3%	59.4%		30.3%	30.3%	10.3%	30.3%	30.3%	10.3%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	6.0		5.0	6.0			5.5	5.0		5.5	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			Yes
Recall Mode	None	Min		None	Min		None	None	None	None	None	None
Act Effct Green (s)	49.1	44.9		50.2	47.0			14.9	24.5		14.9	24.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.63	0.57		0.64	0.60			0.19	0.31		0.19	0.31
v/c Ratio	0.10	0.59		0.38	1.02			0.68	0.20		0.41	0.04
Control Delay	6.6	13.5		9.5	54.0			44.6	21.4		33.8	19.6
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	6.6	13.5		9.5	54.0			44.6	21.4		33.8	19.6
LOS	A	B		A	D			D	C		C	B
Approach Delay		13.4			50.2			36.2			31.1	
Approach LOS		B			D			D			C	
Queue Length 50th (ft)	3	196		15	~663			83	37		44	8
Queue Length 95th (ft)	11	299		38	#983			148	73		88	24
Internal Link Dist (ft)		427			541			622			346	
Turn Bay Length (ft)	250			350					375			85
Base Capacity (vph)	184	2096		273	1097			356	484		336	494
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.10	0.57		0.38	1.02			0.48	0.20		0.29	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 87.5			
Actuated Cycle Length: 78.5			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.02			
Intersection Signal Delay: 32.3		Intersection LOS: C	
Intersection Capacity Utilization 89.1%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 104: Centech Blvd./Cherry Street & Route 20 (Hartford Turnpike)